

# Introduction to Computer Graphics

*Section 8 : [http://bit.ly/section8\\_CG](http://bit.ly/section8_CG)*

*Sheet 8 : [http://bit.ly/sheet8\\_CG](http://bit.ly/sheet8_CG)*

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# Question 1:

What is **hierarchical modeling**?

What are its **advantages**?

# Answer 1:

## In **hierarchical modeling** :

- objects are specified using other objects.
- For example
  - an object A is specified relative to its center which is usually assumed to be located at the origin (object coordinate system).
  - Object A can then be used in another object (say B) specification.
  - To put A in its right place as a part of B, the required transformations are done. Other object C may be specified using B (which in turn contains A) and so on.

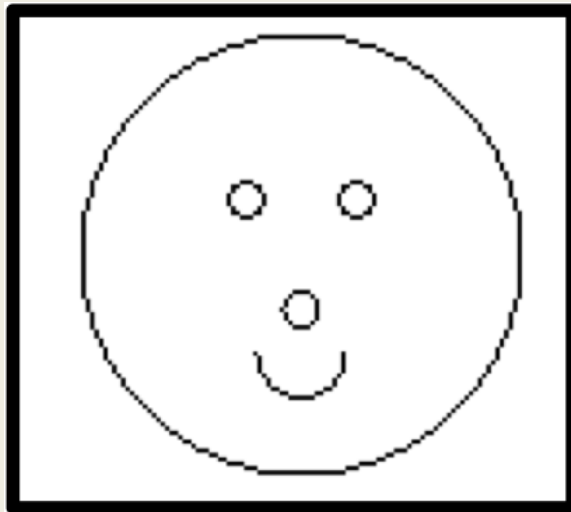
# Answer 1:

## The advantages of hierarchical modeling

- It **motivates modularity** in design. This **simplifies** the design and make its modification more easy and structured
- A **components** is **constructed once** and is used any number of time. In OpenGL this can be implemented using display lists, hence leads to performance enhancement.

# Question 2 :

Write an OpenGL program that draw a face. Model the face simply by one circle for the outline, two circles for the two eyes, one circle for the nose, and one half-circle for the mouse (see the figure below). Your program should use hierarchical modeling implemented by display lists to draw the face.



# Answer 2 :

click [here](#) for code

# Question 3 :

For the program you created in problem 2, modify the code to draw five copies of the face arranged as in the following figure.

# Answer 3 :

click [here](#) for code



# Question 4 :

Explain the role of the following function in GLUT

**glutReshapeFunc(...)**

**glutMotionFunc();**

**glutMouseFunc();**

# Answer 4 :

## **glutReshapeFunc(...):**

Is used to register a callback function for the reshape event. The reshape event occurs when the drawing window size is changed, for example as a result of user interaction.

# Answer 4 :

## **glutMotionFunc():**

Is used to register a callback function for the motion event. The motion event occurs when the user does an active motion with a pointing device. Active motion in the case of a mouse means that the mouse pointer moves while a button is pressed; a passive motion is the movement of the cursor without pressing any buttons.

# Answer 4 :

## **glutMouseFunc():**

Is used to register a callback function for the mouse event. The mouse event occurs when one of the mouse buttons changes state (pressed or released).

# Question 5 :

Write an OpenGL program to draw a **rectangle** of size **3 by 3** units each time the mouse is **left-clicked** with a color chosen randomly. The program terminates when the user **right-click** the mouse. Your program should interact correctly even if the user changed the window size.

Answer 5 :

Report

# Question 6 :

Modify the program in problem 5 to draw the rectangle when the mouse moves while the left button is pressed.

Answer 6 :

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